Only a handful of states both allow full local exchange competition and have certificated entrants.[5] There are regulatory barriers to local competition even in these states. For example, in Illinois MCIMetro must go through a hearing process to obtain approval to provide service. Ameritech has filed to consolidate the MCIMetro case with its application to provide interLATA service. In Maryland, Southwestern Bell Corporation Media Ventures (SBC-MV) has applied for local authority. Bell Atlantic is questioning the technical competence of SBC-MV to deliver high quality telephone service over its cable facilities.[6] As discussed further below, in addition to legal and regulatory barriers to entry, there are significant technical and economic barriers.

There are some experiments or market trials involving cable or wireless companies attempting to learn about local distribution technologies and markets. But these are as advertised -- limited experiments. Even where these experiments are ongoing, they are confined to small geographic areas and quite small numbers of households.[7] These experiments do not represent competition. They are designed to test whether local competition is feasible -- and the results are not in.

There is a small amount of actual exchange access competition today. In particular, the Competitive Access Providers (CAPs) have constructed fiber rings in a number of cities. These

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[5] See NARUC, Report on the Status of Competition in Intrastate Telecommunications, September 23, 1994, Table 7, and individual state summaries.

[6] See Testimony of Donald E. Albert, Case No. 8659, October 26, 1994, pp. 3-5.

[7] For example, Teleport, TCI and Motorola recently announced a six-month test of the feasibility of delivering telephone services over a cable network. The system will be tested in 25 homes. See "Teleport to Conduct Local Service Trial with TCI, Motorola; Annunziata Reports Collapse of Talks with Time Warner," Telecommunications Reports, October 17, 1994, p.3.

fiber rings typically connect selected buildings in the central business districts of larger cities with the POPs of IXCs. The numbers show that the CAPs are an inconsequential factor in the nationwide access business. Table 1 shows an estimate of the current market presence of the CAPs of less than one percent of the total access market. IXCs report that less than one percent of their access payments go to CAPs.[8] Data provided to us by AT&T (discussed below) and MCI show that customer-supplied access (by CAPs or otherwise) is also trivial.

Table 1[9]

1993 CAP v. LEC Access Revenues
(all revenue figures are in millions of dollars)

	LEC	CAP	CAP SHARE
Special Access	3,699	117	3.10%
Switched Access	17,178	32	0.20%
Total Access	20,878	149	.71%

Source: Connecticut Research, Local Telecommunications Competition, 1994, p. II-15, FCC, Preliminary 1993 Common Carrier Statistics and Hatfield Associates estimates. End user revenues were excluded from the LEC totals.

The existing nation-wide presence of the CAPs is obviously minuscule. But as noted earlier, access markets are inherently local. The RBOCs have argued that CAPs have attained a

[8] See Economics and Technology, Inc. and Hatfield Associates, Inc., The Enduring Local Bottleneck, 1994, p. 2. ("ETI/HAI study").

[9] State access revenues were distributed to the special and switched categories in the same proportion as interstate. Connecticut Research data overstate CAP revenues by including non-access services such as diverse routing for IXC POP-to-POP connections and for Centrex service. Elsewhere, Connecticut Research provided data that show that 45 percent of CAP access revenues are for IXC POP-to-POP circuits. This percentage was used to adjust the aggregate 1993 data. See "Access Revenue by Application," Connecticut Research Report on Competitive Telecommunications, January 1, 1994, p.52.

major presence in some of the largest metropolitan areas such as New York City and Chicago.[10] Hatfield Associates recently performed an analysis of the Chicago access market, allegedly one of the most competitive in the U.S.[11] That analysis shows that the incumbent firm, Ameritech, remains the overwhelmingly dominant supplier of exchange access.

In sum, the local exchange service market is not competitive. Exchange access market competition is limited to portions of a few metropolitan areas, and is dwarfed by local exchange carriers even in these geographic markets. Technological change is enhancing the prospects for local competition. However, the development of that competition is highly uncertain. Even under optimistic assumptions, it will take at least several years to produce meaningful competition. In the meantime, the RBOCs will retain substantial market power.

CAP fiber ring expansions, telephony over cable television systems, wireless, telephony over electrical power systems, and satellite service are all potential competitors that may someday bring competition to local markets. All of these potential competitors will have to make substantial investments in sunk capital over a period of many years to become viable alternatives to the incumbent RBOCs. The potential for this competition to develop is not sufficient to prevent RBOCs from using their existing market power to discriminate against ESPs or other companies dependent on access to local telephone networks.[12] Unbundled network

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[10] See, for example, Affidavit of William H. Davidson, Motion of Four RBOCs, Appendix 9, p. 7, footnote omitted.

[11] See Testimony of Robert A. Mercer on Behalf of AT&T Communications of Illinois, Inc., Illinois Commerce Commission, Docket No. 94-0048, August 8, 1994.

[12] See ETI/HAI study. Portions of this work were updated for testimony in the Illinois Ameritech First proceeding. See the Testimony of Robert Mercer, *op. cit.*

elements are still critical, both to the ESPs, in order that they may provide their services in fair competition with the RBOCs, and to potential competitive providers of basic local exchange service.

II. THE ORIGINAL VISION FOR OPEN NETWORK ARCHITECTURE HAS NOT BEEN ACHIEVED

In light of the critical importance of ONA, and the unbundling of network elements it should provide, the fate of ONA has been unfortunate. The Commission has already conceded defeat in its efforts to induce RBOCs to undertake the fundamental unbundling of their networks they promised in the Computer III proceeding, and upon which the Commission relied in granting structural relief. The Commission now asks whether the unbundling that has been undertaken is sufficient to merit relief. The answer is no. The Common ONA Model upon which all of the ONA unbundling undertaken thus far is fundamentally flawed. Even within the scope of this flawed model, little has been achieved. Unbundling undertaken outside of the scope of the original ONA is marginally useful to ESPs, but is insufficient to justify structural relief.

A. The Common ONA Model Is Fundamentally Flawed

On the surface, a common approach to ONA by the RBOCs might appear to have been a desirable goal, in order to attain an appropriate degree of national uniformity. Unfortunately, under the Common ONA Model and the Basic Serving Arrangement (BSA) approach it spawned, the RBOCs attempted to ensure that their limited view of ONA prevailed -- that local exchange networks would not be meaningfully unbundled at all, so competitors would not have access to the basic parts of the local exchange networks and the services they provide on an unbundled basis.

Most parties to the Computer III proceeding thought that there was a fairly unambiguous notion of ONA, consistent with the Commission's own intent. In its Report and Order in Computer III, dated June 16, 1986, the Commission defined ONA as follows:

> ...we consider Open Network Architecture to be the overall design of a carrier's basic network facilities and services to permit all users of the basic network, including the enhanced service operations of the carrier and its competitors, <u>to interconnect to specific basic network functions and interfaces on an unbundled and 'equal access' basis.</u> A carrier providing enhanced services through Open Network Architecture <u>must unbundle key components of its basic services and offer them to the public under tariff</u> ... These components ... may utilize sub-components that themselves are offered on an unbundled basis ... <u>Such unbundling will ensure that competitors of the carrier's enhanced service operations can develop enhanced services that utilize the carrier's network on an economical basis</u>.[13]

In other words, the basic components of the network -- the loop, switching, signaling, intelligent network services, interoffice transport -- and even appropriately-defined subcomponents of these components, such as the distribution and feeder portion of the loop -- would be available on a separate, or "unbundled," basis. A user could buy just those components it needed to construct the services it wished to offer. Thus, for instance, an ESP could purchase just the local loop from the RBOC, and connect it to its own facilities. The basic unbundled components of the network were referred to by the Commission as Basic Service Elements (BSEs).

The RBOCs chose to interpret the Commission's definition quite differently. They developed the Common ONA Model, in which the basic services of the network had to be

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[13] Computer III, at para. 113, emphasis added.

purchased first by a user, and then only some unbundled software features of those services would be available separately. The basic services were called Basic Serving Arrangements (BSAs), while the unbundled features were, according to the RBOCs, the BSEs. Thus the ESP and other competitors of the RBOCs were forced to purchase highly-bundled services, which completely undid the intent of ONA. In fact, many of the features put forward as the BSEs were already under development by the RBOCs prior to the onset of ONA.

Only because the Commission later ordered the RBOCs to explore with the industry how further unbundling might take place did they initiate an industry activity, the Unbundling Forum of the Information Industry Liaison Committee (IILC). Almost nine years later, the work of this unbundling forum has still not come to fruition. When Ameritech found it to be in its self-interest to offer a degree of unbundling (still short of full unbundling), Ameritech did so, but only conditioned on interexchange authority.[14] Meanwhile, the other RBOCs continue to drag out the IILC process, claim network unbundling is so difficult to define as to render it impossible, and generally oppose the fundamental notion of such unbundling.[15]

B. Most Requests for ONA Basic Service Elements Have Not Been Met

After developing their own self-serving ONA model that was fundamentally at odds with the intent of the Commission's ONA construct, the RBOCs have been notably slow in

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[14] Ameritech Petition for Declatory Ruling and Related Waivers, Public Notice DA 93-481, released April 27, 1993 (Ameritech Customer First Plan).

[15] Necessary steps in the further unbundling of the network are discussed in Hatfield Associates, Inc., "New Local Exchange Technology: Preserving the Bottleneck or Providing Competitive Alternatives," April 6, 1992 (ONI Report).

implementing even that model. The July 1994, ONA Services User Guide,[16] published by the RBOCs, shows the status of their ONA offerings compared to the requests of the ESP industry. At an early stage of the proceedings, ESPs and other users identified 118 ONA elements in which they were interested.[17] These were boiled down by the RBOCs into 102 separate ONA services. Of these 102 services, only 19 have been fully deployed by all seven RBOCs. By contrast, 24 of the services have been deployed by three or less of the seven RBOCs in any part of their respective regions, and of these 24, six have not been deployed by any of the RBOCs. But the story is actually worse than that. Of the 118 original requests, 26 were, and still are, classified as requests for "a service that requires development" and dismissed by the RBOCs from further consideration by the wave of a hand. These are dismal implementation statistics, counter to the rosy view of the Commission that ONA is working well and that ESPs can now select from a wide variety of ONA offerings.[18]

C. RBOC Pricing Makes ONA Services Uneconomic

Making interfaces physically available is not enough to ensure that they will be useful to RBOC customers. As noted above, customers desiring access to BSEs must first purchase a BSA. Compared to local business lines, BSAs are very expensive, making it impractical for ESPs to purchase BSEs. For example, in Portland, Oregon, the rate for a single full time,

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[16] Bell Operating Companies, "Service Description, ONA Services User Guide," July 31, 1994.

[17] ESPs submitted 118 requests on a national basis. They made additional requests to individual RBOCs. Only the national requests are considered here.

[18] See In the Matter of Computer III Further Remand Proceeding, Notice of Proposed Rulemaking (Further Remand NPRM) at para. 20.

business line is $35.17 per month; that is a flat rate charge with no usage charges. However, the cost of a FG-A line, a Category 1, Type A - Circuit Switched Line BSA,[19] is $50 per month, plus $.03 per minute of use. For an ESP who wants to maximize the monthly minutes of use on each of his or her circuits, there is a vast difference in these two services.

If the ESP is able to keep a circuit loaded with 6,000 minutes of traffic per month, the charges for the BSA will be $230 ($50 recurring plus 6,000 minutes times $.03 per minute), an increase of 554 percent over the cost of a business line. In return for paying almost $200 more per line for a BSA, the ESP may purchase BSEs not available with a business line. The cost differential is so great, however, that the vast majority of ESPs continue to purchase business lines and have foregone the use of BSEs that might give them the capability to provide new and innovative services for their subscribers.

D. The Mediated Access "Solution" to Advanced Intelligent Network (AIN) Access Is Inadequate

The Commission cites its proposals in the AIN NPRM[20] as another change that justifies eliminating structural separation without requiring full network unbundling.[21] Some background is needed in order to understand this assertion.

In December of 1991, the Commission launched an inquiry into the Advanced Intelligent Network (AIN) plans of the RBOCs. The AIN plan has been developed by Bell

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[19] ONA Services User Guide, *op. cit.*, p. 2.

[20] See, In the Matter of Intelligent Networks, Notice of Proposed Rulemaking (AIN NPRM), CC Docket 91-346, 8 FCC Rcd. G813 (1993).

[21] See, Further Remand NPRM, at para. 31.

Communications Research, Inc., for the RBOCs and Bellcore's other client companies. It describes in a generic fashion how RBOCs might implement a concept called the Intelligent Network (IN) in their networks. The notion of an IN is discussed further in Section III; for now, we briefly summarize its nature by citing the Commission's definition in the NPRM:

> Intelligent networks are designed to facilitate rapid service creation. With intelligent networks, some of the intelligence currently in software housed in every switch is placed instead in fewer, centralized databases. The centralized databases interact with LEC switches to route calls. The use of databases allows new services to be introduced in the network very quickly.[22]

The interaction between the switches and the databases is done over an advanced signaling network called Signaling System #7. By allowing switch control and call processing to be done external to the switches themselves, and providing a general-purpose call processing platform, IN (or Bellcore's AIN) permits a host of new software-defined capabilities to be built into the network and offered to users.

Of key interest in the proceeding, due to its ONA implications, is third party access. This means the ability of non-RBOC service providers -- ESPs, IXCs, CAPs, and end users -- to create programs that will run in the databases of the IN, and thus provide the same ability to develop and implement intelligent call processing capabilities in the RBOC networks as the RBOCs themselves possess. A corollary to this ability is that the third parties are not constrained to offer only services the RBOCs decide to provide, but can be innovative in their approach to developing IN-based services.

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[22] AIN NPRM at. para.6.

The Commission launched the AIN inquiry in response to concerns expressed by various parties that Bellcore, and the RBOCs, were developing AIN as a closed system that provided no one but the RBOCs themselves access to the programming capabilities inherent in AIN. Thus, it was claimed, the RBOCs were planning to introduce a new network technology, which had a high potential for providing new ONA capabilities to users, in a way that did not in fact advance the cause of ONA, because it did not allow third party access to AIN. Instead of being able to define their own services and service features, users would at most have the opportunity to input service-specific parameters into services defined and implemented solely by the RBOCs.

The proceeding led to an NPRM released by the Commission in August 1993. In the NPRM, the Commission proposed to open the programming capabilities of AIN to users in a series of steps, but with access only being provided through a form of "mediated access." Mediated access means the RBOCs have a degree of control over the services implemented by third parties, and hence the innovations those parties bring to the marketplace. Depending on the kind of mediation utilized,[23] this control may be so thorough as to mean the third party cannot develop any services at all, but may merely set parameters in the services the RBOCs are offering.

In the best case, mediation implies the RBOCs will investigate and test the third party services, and will therefore be able to 1) block the implementation of services for anti-competitive reasons, while hiding behind the mantra of "network harms;" and 2) through the investigation and testing they are allowed to do, gain a great deal of intelligence as to the service

[23] The NPRM proposes three kinds of mediation, which are implemented in stages over the next several years.

plans of RBOC competitors. In the worst case, the users will never be able to develop their own service capabilities, but will be limited only to using RBOC-defined services.

More than a year and a half has elapsed since the August, 1993, release of the Commission's NPRM in the proceeding. For the most part, the RBOCs have opposed third party access to IN, and are thus fighting mediated access. As a consequence, no progress has been made during this time. This is unfortunate, for mediated access, not a very satisfactory idea in the first place, becomes more onerous the longer it is delayed. The industry seems to have arrived at the situation in which the RBOCs oppose mediated access to the AIN in any form because of their opposition to third party access, while ESPs and other network providers oppose it because it is not a very satisfactory way to access IN. In this situation, it is certainly not reasonable for the Commission to cite the NPRM as reason for reconsidering structural separation.

E. Unbundling Undertaken Outside of the Scope of the Original ONA Is Marginally Useful to ESPs, but Is Insufficient to Justify Structural Relief

The Commission cites the unbundling that has taken place as a result of the Expanded Interconnection Docket as another factor that might obviate the need for the fundamental unbundling promised by ONA. While transport unbundling is undoubtedly beneficial to the CAPs, it does little for enhanced service providers. As discussed below in Section III, access to the intelligence of the network and higher speed access to end-user customers will provide substantial benefits to ESPs. Transport unbundling provides no new network features and functions that were not available to ESPs from the RBOCs in the first place. Transport unbundling is most useful to customers that purchase carrier access. Most ESPs do not purchase

Feature Group access, because as we have shown previously, the high costs of such access discourage its use.

In terms of unbundling the transmission portions of the local network, much remains to be done even after the Transport unbundling decisions. As discussed above, local competitors require access to the loops and separate access to interfaces within the loop plant of the RBOCs.[24] While this further unbundling will not, by itself, provide a great deal of functionality for ESPs, it will further the prospects for local competition, which will provide ESPs with alternatives to the monopoly RBOCs on which they now are forced to rely.

III. THERE HAVE BEEN SIGNIFICANT TECHNOLOGICAL CHANGES IN LOCAL NETWORKS SINCE COMPUTER III

The original premise of Computer III was that development of sophisticated network technologies would allow fundamental network unbundling and thereby limit the ability of RBOCs to discriminate against competitors. The new technologies that were supposed to allow unbundling are indeed being implemented. However, access to the capabilities made possible by these technologies is not being made available to competitors.

Implementation of these new technologies without fundamental network unbundling <u>increases</u> the competitive advantages conferred on RBOCs by virtue of their control over the local exchange bottleneck. As explained below, these technological trends have made it even more difficult for regulators to detect and remedy any RBOC abuse of their monopoly power over the intelligent, central nervous system of the local network. As a consequence, relief from

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[24] ONI Report, op. cit. See also, Hatfield Associates, Inc., <u>Open Network Architecture: A Promise Not Realized</u> (April 1988).

the structural separation requirements or any other safeguards imposed on the RBOCs would be inappropriate. If anything, the Commission should consider more stringent requirements.

A. New Network Capabilities

In the following sections, new local telephone technologies and the applications they support are described. The implications for interconnection and unbundling policies are explained in the next section. The most significant technological developments of potential interest to ESPs are new signaling systems, the Advanced Intelligent Network, and the deployment of the Integrated Services Digital Network (ISDN).

1. New Signaling Systems

In addition to conveying the customer's actual telephone message or conversation, a telephone network must also convey other information associated with setting up, disconnecting, and otherwise controlling the call. The transmission and reception of such control information between the customer and the network, or between elements (e.g., switches) within the network, is called signaling. Signaling is necessary for the establishment and control of connections through the network or collection of networks. Examples of signaling information include the number of the called party, the number of the calling party, and an indication that the called party has "gone off-hook" (answered the call). Such control information is needed, for example, to route the call and to properly bill for it. An enhanced service provider could use such information to, for instance, determine the identity of a calling party, and thereby call up database information specific to that party, or to be able to store a message in the right voice mailbox.

At the time that Computer III was decided, most signaling in RBOC networks was still carried "in-band," i.e., within the same channel or path that carried the telephone conversation or message. Today, as Table 2 shows, the RBOCs have widely deployed common channel signaling.

Table 2

RBOC SS7 Deployment
(thousand lines)

1986	0
1993	92,439

Source: ARMIS Report 43-07

With common channel signaling, signaling information is exchanged via a data network (actually a specialized packet-switched network) that is separate from the conversation path. Common channel signaling ("CCS") and the Signaling System 7 ("SS7") protocol have become a crucial component of not only ordinary calling, but also of current and future network-based services. Current SS7-based offerings include Calling Card, 800-Number Portability, and CLASS^{SM} services.[25] The latter include automatic callback, automatic recall, calling number/name identification, selective call acceptance/rejection, distinctive ringing, customer control over the time of call origination, and several others.[26] Only a limited number of these features have been made fully available to competitors under ONA plans.

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[25] CLASS was originally an acronym for the term Custom Local Area Signaling Services. It is now used as a servicemark for a collection of telephone company provided services.

[26] Bellcore, "BOC Notes on the LEC Network 1994", Special Report SR-TSV-002275, April 2, 1994, pp. 14-13 thru. 14-19.

2. Intelligent Networks

RBOC switches can also use the SS7 networks to access a remote computing system (e.g., a computer processor and associated data base residing in the network) during the processing of a particular call when some predesignated condition is encountered. The remote computing system can be used, for example, to have the call routed differently depending upon the calling or called number, the time-of-day, additional information requested from the person placing the call, or conditions in the network. For example, all calls to a single telephone number assigned to a particular pizza restaurant chain could be routed to the nearest outlet of the chain based upon the number of the calling customer. A network such as this is generally referred to as an "intelligent network," and these types of services as intelligent network services. Whether one would say there is more processing (that is, intelligence) or that the processing is simply more versatile and accessible, is a moot point.

Intelligent networks are already having a positive effect on users. For example, at one time it was difficult for telephone companies to offer Centrex service on a metropolitan or area-wide basis. In other words, they had difficulty offering an integrated service to a customer who had multiple locations served by different end offices. This had the effect of putting them at a disadvantage compared to PBXs that provided a more integrated solution. With the advent of intelligent network capabilities, the RBOCs were able to offer city-wide Centrex, and this is one of the reasons that Centrex has been able to make "surprising inroads" into the PBX market, as described in a recent report by the North American Telecommunications Association.[27] The

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[27] North American Telecommunications Association, 1993/1994 Telecommunications Market Review and Forecast, (Washington, D.C., 1993), p. 149.

potential intelligent network applications for IXCs and ESPs are obvious. IXCs, for instance, might offer region-wide or nation-wide centrex or a networked Automatic Call Distributor (ACD).[28] An ESP might similarly route a call to different locations depending on the calling number, called number, or other information a caller enters.

The RBOCs, working through Bellcore, have used the term AIN to refer to the new service-independent, intelligent network architecture they are deploying to serve as the platform for their future network-based offerings. Indeed, the AIN vision, which "... builds on and requires the capabilities of CCS,"[29] has been characterized as "... clearly the future of the public network"[30] and as "... being realized through multiple releases of AIN, each with the potential for generating impressive revenue."[31] Implementation of the Advanced Intelligent Network will increase the RBOCs ability to perform the sophisticated functions that their enhanced service and interexchange telephone customers might also wish to exploit.

3. ISDN

Higher speed transmission is critical to the development of many types of enhanced services. Some customers have moved to higher data speeds by obtaining Integrated Services Digital Network ("ISDN") services from their local exchange carriers. In addition to increased

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[28] An ACD distributes incoming calls to available attendant positions. A networked ACD can do the same over a set of ACD's in different locations.

[29] Ann E. Merrell, "CCS/SS7-A Service Perspective," Annual Review of Communications, (National Engineering Consortium, Chicago, IL, 1992), at p. 602.

[30] Dave Glowacz, "AIN Services Get New Life in 1993," Telephony (January 11, 1993), p. 32.

[31] Roger Berman, et al., "AIN: From Vision to Reality," Bellcore Digest (August 1993), p. 1.

capacity, the major differences between ordinary dial-up access and ISDN-based access is that the latter (a) uses digital rather than analog transmission in the local loop and (b) provides a separate out-of-band signaling channel to the customer location.

The importance of ISDN to enhanced service providers was recently emphasized by Bell Atlantic:

> [ISDN] can help consumers, businessmen, educators, and institutions obtain high-speed digital access to the Internet. It can help unlock the vast potential consumer growth that is just being tapped. While traditional telephone lines can give Internet access, they cannot deliver all the exciting services available on this world-wide network. ISDN, on the other hand, can provide consumers with high-speed digital Internet access, allowing use of all of its exciting features.[32]

For a variety of reasons, ISDN underwent a very slow start; however, as Table 3 shows, ISDN penetration is beginning to increase.

Table 3

RBOC ISDN-Available Lines
(thousand lines)

1986	0
1993	39,874

Source: ARMIS Report 43-07

B. Implications of New Technology for Competitors

SS7 networks are both technically sophisticated and crucial to the creation of future network based services. As a consequence, the development of SS7 networks presents a much greater threat that the RBOCs will use their control over the signaling in the local exchange

[32] See, In the Matter of Bell Atlantic Waiver of Section 69.104 of The Commission's Rules in Connection with ISDN Services, Emergency Petition for Waiver, February 8, 1995, p. 2.

network to disadvantage their competitors. That is, when the Commission first proposed network unbundling in Computer III in 1986,[33] and even when it approved the first ONA plans in 1988,[34] techniques for transferring the basic information necessary for interconnection for both IXCs and ESPs were comparatively simple and well defined when provided on an in-band basis; SS7 is much more technically sophisticated and its sophistication will continue to evolve in terms of the services it will support.

As discussed earlier, one of the ironies of the development of interconnection since Computer III is that RBOC competitors are being denied access to the capabilities within the local telephone networks that new signaling systems and the Advanced Intelligent Network make possible. These advanced technologies were originally the basis for the RBOC claims that new technology would allow fundamental network unbundling.

The RBOCs can use their control over the signaling in the local exchange network to limit the nodes that a customer can reach beyond the end office. For example, one of the pieces of information necessary to route an interexchange call beyond the end office is the identity of the caller's Preferred Interexchange Carrier ("PIC"). This piece of information in digital form is known as the Carrier Identification Code ("CIC"). Under equal access, the end office or tandem office routes the call to the preferred carrier based upon this information.

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[33] In the Matter of Amendment of § 64.702 of The Commission's Rules and Regulations, Notice of Proposed Rulemaking (Computer III NPRM), CC Docket 85-229, 50 FR 33581 (August 20, 1985).

[34] In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, CC Docket 88-2, 4 FCC Rcd. 1 (1988).

With the advent of CAPs, it is possible that an additional carrier will be in a position to pick up the call at the end office, switch the call to the appropriate long distance carrier and transport it to the long distance carrier's POP. The local exchange carrier can prevent the CAP from performing this additional routing function simply by refusing to convey the CIC information over their SS7 network.[35]

This notion that the RBOCs would use their control over the signaling network to limit the nodes that a customer can reach beyond the end office is not idle speculation. CAPs and IXCs are having great difficulty in getting competitively critical information transferred over RBOC SS7 networks -- including the CIC information example used here.[36] The exact same sort of problem can be envisioned to happen in enhanced service markets.

Nowhere is the failure of ONA to meet the needs of telephone company customers more obvious than in the area of network management. ESPs, IXCs, CAPs, and, of course, the RBOCs themselves, increasingly require the ability to monitor and control every aspect of their networks. For example, when a user cannot log onto an application, or is experiencing delays, high error rates, or other forms of service degradation, the telecom manager must be able to correlate what the user is experiencing with what is happening within the network. Having made that correlation, he/she must isolate the components causing the problem and fix them.

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[35] As explained later in this section, rather than blatantly refusing to provide such interconnection, the RBOC can simply delay doing so indefinitely by a variety of techniques. This means that the RBOC can damage competition even without pursuing a strategy of outright refusal to convey certain critical information over their SS7 network.

[36] Cornell Declaration, *op. cit.*, at pp. 28-29.

This being the case, the manager -- and/or the external entity that may be providing a management outsourcing service to the corporation -- must secure extensive cooperation from the RBOC. In particular, the manager must be able to interface his/her enterprise Network Management System (NMS) with the OSS (Operations Support System) that manages the transport networks that are part of the firm's overall network. Therefore, to an ESP, IXC, or large corporation, an ONA requirement to provide such OSS interfaces is critically important, even though a traditional equipment-oriented ESP may have little or no need for such an interface.

As a result, various parties requested access to RBOC network status information (#66),[37] access to exchange network testing facilities (#67),[38] the ability to pass network diagnostic information through to users (#86),[39] the ability to <u>initiate</u> diagnostics (#85),[40] and to control the network for user's premises (#102).[41] Most RBOCs have treated the requests as being for a "Service that Requires Development." One RBOC has lumped these requests under a service offering called "Access to Operations Support Systems Infrastructure" and offered certain features in a limited form. Thus, network providers, whether IXCs, CAPs, ESPs, or even end users that might wish to use ONA offerings to build their corporate enterprise networks, are not being well served by the ONA offerings of the RBOCs.

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[37] ONA Services Guide, *op. cit.*, Appendix A, p. 10.

[38] *Id.*

[39] *Id.* p. 13.

[40] *Id.*

[41] *Id.* p. 15.

C. Enforcement Problems Created by the New Technologies

The deployment of SS7 and the implementation of AIN by the RBOCs increases their ability to discriminate against ESPs, against IXCs, and against potential local exchange competitors if they emerge. As explained above, with in-band signaling, the information being transferred was necessarily simple and the technique supported only basic call setups and a limited number of additional services. Moreover, because the signaling was done on a "per trunk" basis, there was less threat that a failure would cause disruptions on a widespread basis.

The deployment of SS7 and the implementation of AIN creates an entirely different situation. In addition to the specialized packet switches and high speed data lines which comprise the SS7 network, the AIN architecture includes a host of additional network elements, including Service Switching Points, Service Control Points, Adjuncts, Intelligent Peripherals, and Service Nodes. These additional elements interconnect in complex ways and are involved in the collection, storage and interaction with information collected from customers and the execution of sophisticated call processing logic by the associated network-based computer systems. These additional elements significantly increase the potential number of points of interconnection, and the interconnection at those points is rendered significantly more complex due to the sophistication of the protocols, the greater number of message sets, and possible interaction among the various elements comprising the AIN.

Because of this significantly greater complexity, the RBOCs have a greatly increased ability to use their control over signaling in the local exchange network to discriminate against competitors. For example, they can refuse to provide interconnection at critical points on the basis of alleged technical harm to the network. They can refuse to convey certain types of control messages across the IN for the same reason or because of claims that standards for a particular message type do not exist. They can refuse to provide certain forms of interconnection unless the signaling messages pass through some type of "filter" that they control -- a filter that is not actually needed to ensure the integrity of the network. They can use this control over the filter to artificially restrict the message sets to those associated with services they wish to offer. They can refuse to provide certain information collected from customers and stored in the network on the basis that the information is proprietary. They can refuse to develop and execute certain types of service logic on the basis of potential technical harm or developmental costs or priorities. These examples are not hypothetical; in each case one or more RBOCs has treated competitors as described.[42]

Because of the technical complexity of the SS7/IN architecture, the critical role it plays as the "nervous system" of the network, and the necessarily more limited technical knowledge of outsiders, determining whether or not a particular refusal or delay is justified becomes an almost impossible task for competitors and regulators. The ability to refuse or delay such requests puts the RBOC in the position of controlling the development of new and competitive services, both as to whether the new service is created at all or, more subtly, when it comes to market. Through this means, the RBOCs have the ability to extend their monopoly control over the loop into the critical area of signaling, and, because it is so abundantly clear from their own emphasis on the importance of AIN, to use that control over signaling to discriminate against competitors in the provision of new services. The RBOCs' critical role in determining the availability and timing of

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[42] Cornell Declaration, *op. cit.*, pp. 27-28.

interconnection with potential competitors is explicitly acknowledged in the following passage from the technical paper by a Director at Bellcore that was referenced earlier:

> With the deployment of CCS networks by both local exchange and interexchange carriers in the U.S., a logical next step is to interconnect these signaling networks to support end-to-end capabilities. Interconnection between the seven regions' CCS networks has already occurred to support Calling Card validation. The regions are in various stages of interconnection with interexchange carriers to provide SS7 call set-up on interLATA calls. This would permit Calling Number Delivery to work on interLATA calls, as well as provide additional reductions in call set-up times.
>
> Extensions of other services to function on an interLATA basis are technically feasible. However, in addition to the need to determine the market potential of such extensions, there are possible business, regulatory and legal issues that may need to be addressed first.[43]

This shows that, first, the RBOCs may choose not to make technically feasible forms of interconnection available for strategic business reasons and, second, that they can raise a host of market, regulatory and legal issues in order to delay technically feasible interconnections for potential competitors. In addition, the central involvement of Bellcore in the design of SS7/IN architecture will result in a relatively standard approach among the RBOCs. This coordination will make it even more difficult for regulators to detect and prevent anticompetitive conduct since benchmark regulation is less likely to work.

ISDN presents similar problems. This increased threat to competition is analogous to the increased threat associated with the deployment of SS7 in the local exchange network, as described above. Perhaps this added threat can best be understood by first recognizing that the

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[43] Merrell, *op. cit.*, p. 601. [Emphasis added.]

customer's ability to send signaling information on an in-band basis over today's analog loops is limited (even with a touchtone equipped telephone) to sending the numbers 0 through 9, sending the symbols * and #, and initiating a "switch-hook flash." Using ISDN, with its out-of-band signaling in the loop itself, the customer can send or receive a much richer and more easily changed set of control messages at a much faster rate, thus providing the support for greatly increased functionality and new services.

However, the RBOCs control both the information carried within the signaling messages in the ISDN signaling channel (i.e., the signaling content) and the transfer of that signaling information between the loop/end office and the interoffice SS7 network described earlier. Their control over what information is carried in the signaling messages stems from their control of the local loop, their leverage over the standards-making activities associated with the local network, and their control over the first point of switching. In other words, it does no good for a customer to generate a new control message that the switch ignores. Likewise, it does no good for an ESP or an interexchange carrier to send a new control message to the end user if the RBOC refuses to carry that control message over its SS7 network, refuses to translate between the SS7 protocol and ISDN control channel protocol, or refuses to carry the new message over the ISDN control channel. It is this control over signaling in the local network that greatly increases the ability of the RBOCs to discriminate in an ISDN environment.[44]

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[44] Affidavit of Stephen G. Huels, AT&T Opposition to the Four RBOCs' Motion to Vacate the Decree, U.S. v. Western Electric, Civil Action No. 82-0192 (HHG), December 7, 1994 (AT&T Opposition), Appendix A. 5, pp. 7-10.

IV. THE RBOCs HAVE AMPLE OPPORTUNITIES TO ENGAGE IN DISCRIMINATORY AND ANTI-COMPETITIVE PRACTICES AGAINST THEIR POTENTIAL COMPETITORS

Section II demonstrated that the original promise of ONA was not realized for the network that existed in when was first proposed. Section III demonstrated that ESPs and other RBOC customers are not being granted access to evolving features and functions of the network such as the IN, new signalling capabilities and ISDN. Technology will continue to evolve. For example, many RBOCs are proposing to replace existing copper loop plant with some form of a broadband network. As technology evolves, the needs of customers for unbundled access will also evolve. Network architecture, design, implementation and operational decisions by the RBOCs can all affect the nature and quality of access received by RBOC competitors.[45] These issues are discussed below.

A. Architecture Issues

The first, and most fundamental, decision in the creation of any network is the choice of the basic architecture. The concept of a network architecture includes not only the choice of a topology (e.g., star, ring, bus or some hybrid combination), but also choices such as (a) how the network is to be broken down into functional hardware and software "building blocks," (b) at what points the building blocks connect and how the connections, or interfaces, are defined, (c) which protocols are chosen to allow these functional building blocks to communicate with one another (i.e., the signaling scheme), and (d) whether the architecture is open or closed. Through these architectural choices, which are highly technical in nature, the RBOCs can discourage, or

[45] Of course, even if ONA results in the availability of valued features and functions, price can be used by the RBOCs to discriminate against their ONA customers.